EXECUTIVE SUMMARY

Idaho Law 22-5103 (enacted on July 1, 2002) instructed the Idaho Soil Conservation Commission (SCC) to prepare a report exploring the potential for carbon sequestration on agricultural and private, non-industrial forest lands. This report was to also explore the production and use of biofuels, ethanol and biodiesel. This law, which originated from Senate Bill (S) 1379a, instructed the SCC to prepare a report by February 1, 2003, with input from a Governor appointed Carbon Sequestration Advisory Committee. Numerous individuals and this Committee met three times to provide review of critical elements of this report. Two technical papers have been produced to assist in the preparation, presentation, and discussion of this report, and are located in the Appendices. This report will address the following:

1. The potential for development of a system or systems of carbon emissions trading or markets for carbon sequestered on agricultural and forest land;
2. Agricultural and forestry practices, management systems or land uses, and biofuels production which increase stored soil carbon (and/or offset greenhouse emissions);
3. Methods for measuring and modeling net carbon sequestration associated with various agricultural and forestry practices, management systems or land uses occurring on agricultural and forest lands and legislation, if any, to define and protect property rights in and attendant to carbon sequestration;
4. Areas of scientific uncertainty with respect to quantifying and understanding carbon sequestration associated with agricultural and forestry activities; and
5. Recommendations of the carbon sequestration advisory committee developed pursuant to section 22-5103, Idaho Code.

There is a concern that the use of non-renewable fuels and other human activities are increasing greenhouse gases in the atmosphere, contributing to global warming. The latest assessment by the United Nations Intergovernmental Panel on Climate Change (IPCC, 2001), a body of 1500 scientists from throughout the world, concludes that the threat of climate change is very real. Sea surface temperatures and sea level are rising, continental glaciers are melting worldwide, and carbon dioxide concentrations in the atmosphere continue to increase. So far, the increase in global mean surface temperature has not been great, a little more than 1 ^{o}F during the past 100 years. However, IPCC concludes that the 21st century will be much warmer, an increase of 2.5-10.4 ^{o}F in average surface temperature during the next 100 years (IPCC, 2001). Large reductions in greenhouse gas emissions, possibly up to 70%, may be needed to stabilize the atmospheric concentration of carbon dioxide.

Currently, Idaho emissions seem to be relatively low compared to most other states. Carbon sequestration and other related greenhouse gas activities could offset emissions from sources located outside of the state. These practices or activities, such as those that sequester (store) carbon in forested or agricultural soils and croplands, and the production and use of biofuels, can create additional jobs and diversify agriculture; and conserve and protect existing natural resources, assisting the state in meeting natural resource objectives.

There are many agriculture, forestry, biofuels, and bioenergy practices that could be implemented within the state of Idaho. The Carbon Sequestration Advisory Committee is recommending 'whole-farm' evaluations utilizing case studies, state-wide economic analysis, and research activities. Some of these practices seem acceptable to landowners, effective in carbon sequestration, and/or reducing on-site emissions.

The following practices and activities have been evaluated for the purpose of exploring the potential for Idaho landowners to sequester carbon on and/or reduce greenhouse gas emissions related to their operation:

High potential for state-wide carbon sequestration:

- Afforestation (new forest) on poorly stocked forest lands,
- Nutrient management,
- Biomass (cropland residues) energy source
- Afforestation on marginal cropland,
- Ethanol production and use,
- Residue management (no-till, direct seed),
- Biogas recovery, digesters,
- Afforestation on non-stocked forest land,
- Reduced methane emissions from dairy livestock,

Moderate potential for state-wide carbon sequestration:

- Short rotation woody crops,
- Prescribed grazing on rangeland,
- Cropland residue burning alternatives or techniques,
- Land conversion to permanent grass cover (similar to CRP),
- Rangeland planting,
- Windbreaks & shelterbelts,
- Afforestation on marginal pastureland,
- Riparian conservation/restoration on private land,
- Reduced methane emissions from non-dairy livestock,

Low potential for state-wide carbon sequestration:

- Cover crops,
- Pastureland planting,
- Prescribed grazing on pasture land,
- Afforestation on pivot corners,
- Riparian forest buffers on non-forested land
- Riparian conservation/restoration on state land,
- Biodiesel production and use,
- Grassed waterways,
- Wetland construction and enhancement

The most effective practices increase above- and below-ground carbon, such as in forest plantings, no-till, and the conversion of marginal cropland and pasture land to trees, where new forest lands can sequester a large amount of carbon. Ethanol production could be very effective in reducing Idaho's transportation related greenhouse gas emissions. Biodiesel is not as effective compared to ethanol, mostly due to available acres of canola. Methane emission reductions from animal waste storage ponds seems promising, but acceptability may be low and installation costs high. If funding became available, the 'digester' technology may become more feasible to install on confined animal facilities, especially with operators being faced with odor regulations. Alternatives to burning crop residues can result in significant emissions reductions as well.

Idaho has the ability to sequester and/or offset nearly 15 million metric tons of carbon dioxide equivalents lo(CO_{2e}) per year. Afforestation, biofuels production, biogas recovery, nutrient management, no-till,

methane reductions and agriculture energy sources could provide most of the state's sequestration and emission offsets. If public lands were to be included in a state-wide estimate, there could be a significantly greater amount of carbon sequestration and/or offsets.

Idaho's potential to increase stored carbon and reduce agricultural related emissions indicates a potential for carbon market activity. Potential purchasers of carbon 'credits' are likely to come from outside of the state, while Idaho's greenhouse gas emissions are low. The state would need to provide landowners a process to create carbon credits and an avenue for buyers to purchase those credits. Some carbon market activity has started in the state. There seem to three important elements missing or yet to occur that would kick-start a carbon market in the U.S. and Idaho. 1) Regulatory CO_2 emission reductions on point sources, such as electrical producers, 2) Public acceptance of carbon markets, allowing emission offsets, and 3) Carbon market and trading rules. Upon regulatory action, likely first by the U.S. Congress and EPA, carbon market development is sure to progress at a much faster pace.

The Pacific Northwest Direct Seed Association (PNDSA) has entered into an agreement with a southeastern U.S. company (ENTERGY) to purchase carbon 'credits' created from direct seed operations in north Idaho. Direct seeded acres have been estimated to sequester 0.55 metric tons of carbon dioxide per acre, per year (MT CO_2/y). The Nez Perce Tribe has been in negotiations with potential carbon credit buyers to sell credits generated from newly forested croplands in Northern Idaho.

Numerous ancillary benefits might be resultant of practices evaluated within this report:

- Water quality improvements (surface and ground waters),
- Total Maximum Daily Load (TMDL) targets could be met,
- Threatened and endangered species could be conserved,
- Air quality and odor problems may be resolved.

Economic benefits may be greatly appreciated as well. On-farm net returns may increase, local economies may be improved through increased employment and revenue, and programs may benefit from funding coming from sources outside of the state, which could reduce the demand for state funding.

A landowner actually producing a carbon credit, will consider the actual carbon sequestered and the emissions associated with the land use activities, a process that determines their baseline carbon and greenhouse gas emissions level. There are a number of methods used to verify an amount of carbon sequestered or reduction of greenhouse gas emissions that may be acceptable to carbon market participants. Further work is needed, however, to better predict and measure a 'whole-farm' net credit. The methods are key in predicting the potential for carbon markets in Idaho, which then predicts the benefit to the state. Sequestered carbon and greenhouse emissions relative to the land use activity will need to be calculated to determine a true credit, which is then potentially available for purchase.

If the state were to become active in carbon markets, great opportunity exists to partake of significant funding, which would enhance local economies, improve agriculture and forestry production, and net profits. In addition local economic enhancements relative to farm and forest operation, numerous environmental improvements might be achieved. Most practices that sequester carbon have a direct benefit to natural resources. Funding generated through carbon markets may range from $8 to $146 million, if greenhouse gas sources are mandated to reduce emissions. Emission sources might face reduction costs of $20 to $200 per metric ton initially. To meet anticipated regulations, greenhouse gas sources would need to reduce their emissions and/or purchase carbon offsets (credits) for some period of time.

Carbon sequestration on forest and agricultural lands seems to be much less expensive, where Ney et. al, 2000 estimates the rate for one metric ton of carbon sequestered is valued around $1 - $2. If greenhouse gas emissions become regulated, the carbon offset value will certainly increase, overcoming implementation costs. Assuming that greenhouse gas emission sources become regulated, a conservative estimate for carbon credits could be approximately $10 per ton of CO_2 offsets. This would indicate that the potential annual inflow to the state could be in the millions, upwards of $146 million. Current carbon offset prices in Oregon, for example, are currently much less than the $10 per-ton carbon offset. Oregon regulations have set a per-ton carbon offset rate at $0.57, to be paid by new utilities that cannot meet a CO_2 emissions cap at the plant. At the current Oregon carbon offset rate, Idaho could see about $8 million come into the state, though dependent on carbon market participation. Regardless of the price of carbon offsets, there can be a substantial amount of funding come into the state through a carbon market.

There are numerous issue related to climate change and carbon sequestration. Within each of these issues are many uncertainties. Some of the uncertainties follow:

- Predicting and quantifying soil carbon, above- and below-ground biomass (vegetation) stored carbon
- Predicting and quantifying methane emissions from animal waste storage ponds and livestock enteric fermentation
- Predicting and quantifying nitrous oxide emissions from agricultural activities,
- Calculating a whole-farm, field, or project's net carbon sequestration level, which discounts land use related greenhouse emissions
- The potential quantity of agricultural products that are available and could be made available for biofuels production
- The potential quantity of agricultural products that are available and could be made available for bioenergy production, such as in co-fired facilities
- The potential effects of local climate change, weather, and catastrophic events on practice performance
- The potential future electrical demand in the state, from coal-fired electrical facilities
- Legal ramifications of long-term contracts between buyers and agricultural and forest landowners
- Landowner costs and benefits while implementing practices and participating in carbon markets
- Statewide costs and benefits while implementing practices and participating in carbon markets

Upon considerable review, the Advisory Committee has developed the following recommendations:

- Maintain the carbon sequestration advisory committee to monitor ongoing developments, facilitate economic analysis, facilitate research activities, and provide information to landowners
- Initiate a carbon market pilot project
- Improve landowner's understanding of carbon sequestration and climate change
- Enhance carbon sequestration research relevant to Idaho
- Complete carbon sequestration and greenhouse gas baseline analyses to prepare for future carbon sequestration markets
- Further study the potential economic benefits to Idaho landowners and the state through carbon markets
- Explore requiring carbon participants to be registered with the state
- Explore avenues to increase carbon sequestration in the state
- Explore the potential for improving the production and use of biofuels in the state, and their economic benefit

The Soil Conservation Commission and the Carbon Sequestration Advisory Committee is prepared to assist the state in enhancing its carbon market potential, increase carbon sequestration knowledge, and seek funding to carry out these recommendations. There is a substantial amount of work yet to be done before the state can fully engage and benefit from carbon market activities.